VERIFICATION OF TRANSLATION

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[Title] CURABLE COMPOSITION

[Claims]

[Claim 1] A curable composition comprising:

(A) an oxyalkylene polymer that has 0.6 to 1.5 reactive silicon groups per molecule, and has a number average molecular weight of 15,000 to 50,000, and a Mw/Mn value of 1.6 or less;

(B) a filler; and

(C) a curing catalyst,

wherein the curable composition comprises no plasticizer.

[Detailed Description of the Invention]

[0001]

[Technical Field]

The present invention relates to a curable composition which improves the staining property of the cured product obtained from the curable composition that contains an oxyalkylene polymer having a reactive silicon group, a filler, and a curing catalyst, and ensures mechanical properties favorable for a sealant such as low stress and high elongation.

[0002]

[Prior Art]

Reactive silicon group-containing polymers undergo crosslinking curing in the presence of moisture. Among such polymers, for example, a curable composition which contains a polymer having a main chain skeleton formed of a polyoxypropylene, has characteristics such that it is liquid at room temperature and turns into a rubbery elastic substance by curing, and is accordingly widely used as sealants for use in building construction.

[0003]

Various physical properties are demanded when curable compositions are used in building construction. One example of such properties is a property that the staining around the sealing joints can be suppressed.

[0004]

As one of the causes for the staining around joints, the bleeding of the plasticizers contained in the sealants may be cited. However, exclusion of the plasticizers leads to a problem that the physical properties of the cured product tend to be high in modulus and low in elongation, resulting in the quality degradation and other failures of the sealants. Also, in the case where the average number of the reactive silicon groups contained in one molecule of the oxyalkylene polymer is decreased for the purpose of lowering the modulus of the plasticizer-free cured product, there occurs a problem that the proportion of the nonfunctional oxyalkylene polymers having absolutely no reactive silicon groups is increased, and such oxyalkylene polymers cause staining around joints and other failures, similarly to the plasticizers.

[0005]

Patent Document 1 discloses a curable composition which includes an oxypropylene polymer, containing at least one reactive silicon group and having Mw/Mn = 1.6 or less and a number average molecular weight of 6,000 or more, a filler and a curing catalyst, but does not include a plasticizer, wherein the dust adhesion of the curable composition is improved while the workability thereof is being maintained. Examples 1 and 2 of Patent Document 2 also present curable compositions each of which includes an oxypropylene polymer, having a number average molecular weight of 10,000 and Mw/Mn = 1.2 and containing approximately 2.4 reactive silicon groups in one molecule of the oxypropylene polymer, a filler and a curing catalyst, but does not include a plasticizer.

[0006]

[Patent Document 1] Japanese Patent Laid-Open No. 5-65403

[0007]

[Patent Document 2] Japanese Patent Laid-Open No. 5-65403 (Example 1 or 2)

[0008]

[Subject to be solved by the Invention]

However, there has been a problem in that the physical properties of the cured product obtained from the compositions described in the aforementioned patent documents involve low elongation and other failures to degrade the quality as a sealant.

[0009]

[Means for solving the Problem]

In view of the above described circumstances, the present inventors have made diligent researches, and consequently achieved the present invention by finding that a cured composition, in which the proportion between a liquid component including a particular oxyalkylene polymer, a filler and a curing catalyst, but free of any plasticizers can provide a cured product having mechanical properties, desirable for sealant, such as low staining, low stress and high elongation. More specifically, the present invention relates to a curable composition, comprising: (A) an oxyalkylene polymer that has 0.6 to 1.5 reactive silicon group per molecule, and has a number average molecular weight of 15,000 to 50,000, and a Mw/Mn value of 1.6 or less; (B) a filler; and (C) a curing catalyst, wherein the curable composition comprises no plasticizer. Herein, the definition of the term "plasticizer" is intended not to include minor liquid ingredients used for dissolving powdery additives, etc., namely minor liquid ingredients existing in an amount which does not contribute to modulus or elongation properties of cured products are not included in the definition of the "plasticizer" herein.

[0010]

[Mode for Carrying Out the Invention]

The reactive silicon group of the (A) oxyalkylene polymer that has 0.6 to 1.5 reactive silicon groups per molecule, and has a number average molecular weight of 15,000 to 50,000, and a Mw/Mn value of 1.6 or less is not particularly limited, and typical examples thereof include the groups represented by the general formula (1):

$$-[Si(R^1_{2-b})(X^1_b)O)_m Si(R^2_{3-a})X^1_a \cdots (1)$$

wherein R^1 and R^2 represent the same or different alkyl groups having 1 to 20 carbon atoms, aryl groups having 6 to 20 carbon atoms, aralkyl groups having 7 to 20 carbon atoms, or triorganosiloxy groups represented by $(R')_3SiO-$, and when two or more R^1 or R^2 are present, they may be the same or different; herein, R' is a monovalent hydrocarbon group having 1 to 20 carbon atoms, and the three R' groups may be the same or different; X^1 represents a hydroxyl group or a hydrolyzable group; a represents 0, 1, 2 or 3; b represents 0, 1, or 2, with the proviso that the relation $a + \Sigma b \geq 2$ is satisfied; the b values in all m of the $-Si(R^1_{2-b})(X^1_b)-O-$ groups may be the same or different, and m represents an integer of 0 to 19.

No particular constraint is imposed on the hydrolyzable group as X^1 described above, and any hydrolyzable groups well known in the art may be used. Specific examples of such hydrolyzable groups may include: a hydrogen atom, a halogen atom, an alkoxy group, an acyloxy group, a ketoximato group, an amino group, an amido group, an acid amido group, an aminooxy group, a mercapto group and an alkenyloxy group. Among these groups, alkoxy groups such as a methoxy group, an ethoxy group, a propoxy group and an isopropoxy group are particularly preferable because of the moderate hydrolyzability and easy handleability.

[0011]

To one silicon atom, 1 to 3 of the hydroxy and hydrolyzable groups can be bonded, and $(a + \Sigma b)$ is preferably 2 to 5. When two or more hydroxyl groups or hydrolyzable groups are present in a reactive silicon group, those groups may be the same or different.

[0012]

The number of silicon atoms in the reactive silicon group may be one, or two or more. In the case that silicon atoms in the reactive silicon group are bonded together by siloxane bonding or the like, the number of silicon atoms may be about 20.

[0013]

Preferable reactive silicon groups are ones represented by the following general formula (2) because of easy availability.

$-Si(R^2{}_{3-e})X^1{}_e \cdots (2)$

wherein R^2, X^1 is the same as defined above; e is 2 or 3.

Specific examples of R^1 or R^2 in the above general formula (1) or (2) include alkyl groups such as methyl or ethyl; cycloalkyl groups such as cyclohexyl; aryl groups such as phenyl; aralkyl groups such as benzyl; triorganosiloxy groups represented by $(R')_3SiO-$, wherein R' is methyl or phenyl.

[0014]

The main chain structure of the oxyalkylene polymer (A) which is to be used in the present invention is a polymer having a structure represented by -R-O- as repeating unit, wherein R is a divalent alkylene group having 1 to 20 carbon atoms. The component (A) may be either a homopolymer in which all the repeating units are the same or a copolymer in which two or more types of repeating units are included. The component (A) may have one or more branch structures in the main chain thereof.

[0015]

Specific examples of R may include $-CH_2CH_2-$, $-CH(CH_3)CH_2-$, $-CH(C_2H_5)CH_2-$, $-C(CH_3)_2CH_2-$ and $-CH_2CH_2CH_2CH_2-$. As R, $-CH(CH_3)CH_2-$ is particularly preferable.

[0016]

The main chain skeleton of the oxyalkylene polymer as the component (A) is obtained, for example, by ring-opening polymerization of monoepoxide in the presence of an initiator and a catalyst.

[0017]

Specific examples of the initiator may include dihydric alcohols and polyhydric alcohols such as ethylene glycol, propylene glycol, butanediol, hexamethylene glycol, methallyl alcohol, bisphenol A, hydrogenated bisphenol A, neopentyl glycol, polybutadiene diol, diethylene glycol, triethylene glycol, polyethylene glycol, polypropylene glycol, polypropylene triol,

polypropylene tetraol, dipropylene glycol, glycerin, trimethylolmethane, trimethylolpropane and pentaerythritol; and various oligomers having hydroxyl groups.

[0018]

Specific examples of the monoepoxide may include: alkylene oxides such as ethylene oxide, propylene oxide, butylene oxide, butylene oxide, hexene oxide, cyclohexene oxide, styrene oxide and methylstyrene oxide; alkyl glycidyl ethers such as methyl glycidyl ether, ethyl glycidyl ether, isopropyl glycidyl ether and butyl glycidyl ether; allyl glycidyl ethers; and aryl glycidyl ethers.

[0019]

As the catalyst, catalysts well known in the art may be used. Examples of such catalysts may include: alkali catalysts such as KOH, NaOH and CsOH; acidic catalysts such as trifluoroborane-etherate; alumino-porphyrin metal complexes; and double metal cyanide complex catalysts such as zinc cobalt cyanide-glyme complex catalyst. Particularly, the use of the double metal cyanide complex catalysts which scarcely cause side reactions is preferable because the Mw/Mn values of the products are small and the viscosities thereof become low to ensure the favorable workability; however, catalysts other than the double metal cyanide complex catalysts may also be used.

[0020]

Additionally, the main chain skeleton of the oxyalkylene polymer can also be obtained by subjecting a hydroxyl group-terminated oxyalkylene polymer to a chain elongation with a difunctional or higher alkyl halide such as CH_2Cl_2 and CH_2Br_2, in the presence of a basic compound such as KOH, NaOH, $KOCH_3$ or $NaOCH_3$.

[0021]

Methods for producing oxyalkylene polymer, which is the (A) component to be used in the present invention are not partcularly limited, and various methods may be used. Particularly preferable one is a method including reacting an

oxyalkylene polymer having, at the terminals thereof, an unsaturated group represented by the general formula (3):

$H_2C=C(R^3)-R^4-O-$ ···(3)

or the general formula (4):

$HC(R^3)=CH-R^4-O-$···(4)

wherein R^3 is a hydrogen atom or a hydrocarbon group having a 10 or less carbon atoms, R^4 is a bivalent organic group having 1 to 20 carbon atoms,

with a reactive silicon group-containing compound represented by the general formula (5):

$H-[Si(R^1_{2-b})(X^1_b)O]_mSi(R^2_{3-a})X^1_a$···(5)

wherein R^1, R^2, X^1, a, b, m are the same as defined above, in the presence of a group VIII transition metal catalyst.

[0022]

As the production method of the oxyalkylene polymer having, at the terminals thereof, an unsaturated groups represented by the general formulas (3) and (4), methods well known in the art may be used; examples of such methods may include a method in which a hydroxyl group-terminated oxyalkylene polymer is reacted with a compound having an unsaturated bond to make bonds with the compound through ether bonds, ester bonds, urethane bonds, carbonate bonds and the like. For example, when the unsaturated groups are introduced through ether bonds, there can be cited a method in which the terminal hydroxyl groups of the oxyalkylene polymer each are subjected to metal-oxidation to be -OM (M is Na, K or the like), and thereafter, the thus modified oxyalkylene polymer is reacted with an unsaturated group-containing compound represented by the following general formula (6):

$H_2C=C(R^3)-R^4-X^2$ (6)

or the general formula (7):

$HC(R^3)=CH-R^4-X^2$ (7)

wherein R^3 and R^4 is the same as above; and X^2 is a halogen atom.

[0023]

Specific examples of the unsaturated group-containing compound represented by the general formula (6) or (7) may

include: $H_2C=CH-CH_2-Cl$, $H_2C=CH-CH_2-Br$, $H_2C=C(CH_3)-CH_2-Cl$, $H_2C=C(CH_3)-CH_2-Br$, $H_2C=C(CH_2CH_3)-CH_2-Cl$, $H_2C=C(CH_2CH_3)-CH_2-Br$, $H_2C=C(CH_2CH(CH_3)_2)-CH_2-Cl$, $H_2C=C(CH_2CH(CH_3)_2)-CH_2-Br$, $HC(CH_3)=CH-CH_2-Cl$ and $HC(CH_3)=CH-CH_2-Br$; wherein $H_2C=CH-CH_2-Cl$ and $H_2C=C(CH_3)-CH_2-Cl$ are particularly preferable.

[0024]

In the method for introducing the unsaturated groups, isocyanate compounds, carboxylic acids and epoxy compounds having the $H_2C=C(CH_3)-CH_2-$ group or the $HC(CH_3)=CH-CH_2-$ group may also be used, in addition to the above compounds.

[0025]

As the group VIII transition metal catalyst, effectively used is the complex catalyst of a metal selected from the group VIII transition metals such as platinum, rhodium, cobalt, palladium and nickel. For example, there may be used compounds such as $H_2PtCl_6 \cdot 6H_2O$, a platinum-vinylsiloxane complex, a platinum-olefin complex, Pt metal, $RhCl(PPh_3)_3$, $RhCl_3$, Rh/Al_2O_3, $RuCl_3$, $IrCl_3$, $FeCl_3$, $PdCl_2\ {}_2H_2O$ and $NiCl_2$; however, the group VIII transition metal catalyst is particularly preferably any one of $H_2PtCl_6 \cdot 6H_2O$, a platinum-vinylsiloxane complex, a platinum-olefin complex from the viewpoint of the hydrosilylation reactivity.

[0026]

The hydrosilylation reaction is favorably carried out within a temperature range usually from 10 to 150°C, preferably from 20 to 120°C, and more preferably from 40 to 100°C; according to the needs such as the adjustment of the reaction temperature and the adjustment of the viscosity of the reaction system, there may be used solvents such as benzene, toluene, xylene, tetrahydrofuran, methylene chloride, pentane, hexane and heptane.

[0027]

As the catalyst for the hydrosilylation reaction, $AlCl_3$, $TiCl_4$ and the like may also be used in addition to the aforementioned ones.

[0028]

For the purpose of accelerating the hydrosilylation reaction, there may be used methods based on the reactivation of the catalyst by use of oxygen (Japanese Patent Laid-Open No. 8-283339), the addition of sulfur or the like.

[0029]

Also, for the purpose of suppressing the oxidation, due to oxygen, of the oxyalkylene polymer, the reaction solvent and the like in the hydrosilylation reaction, the hydrosilylation reaction may be carried out in the presence of an antioxidant.

[0030]

The number of reactive silicon groups in a molecule of the oxyalkylene polymer is preferably 0.6 to 1.5. If the number of reactive silicon groups in a molecule of the oxyalkylene polymer is less than 0.6, curability becomes insufficient, and the number is larger than 1.5, the cured product shows high modulus and low elongation, and thus, it is not preferable. The number of reactive silicon groups in a molecule of the oxyalkylene polymer is more preferably 0.9 to 1.5, and particularly preferably 1.2 to 1.4 in order to ensure excellent curablity and mechanical properties suitable for sealants.

[0031]

There are several possible methods for measuring the introduction rate of the reactive silicon group. At present, accurate values can be obtained, on the basis of the ^{1}H NMR spectra, from comparison of the integrated values for the terminals having the reactive silicon groups with the integrated values of the terminals having no reactive silicon groups.

[0032]

The molecular weight of the oxyalkylene polymer is preferably 15,000 to 50,000 in terms of the number average molecular weight, based on GPC, relative to polystyrene standard. When the number average molecular weight is less than 15,000, unpreferably the cured product of the obtained reactive silicon group-containing oxyalkylene polymer become brittle. When the

number average molecular weight exceeds 50,000, unpreferably the oxyalkylene polymer becomes so high in viscosity that the handling thereof becomes difficult. The number average molecular weight is more preferably 17,000 to 40,000, and particularly preferably 20,000 to 30,000 for the purpose of attaining the mechanical properties and ensuring the workability.

[0033]

The Mw/Mn value of the oxyalkylene polymer is preferably 1.6 or less. When the Mw/Mn value exceeds 1.6, the viscosity of the oxyalkylene polymer unpreferably becomes too high to make the handling thereof difficult. The Mw/Mn value concerned is preferably 1.5 or less, and particularly preferably 1.4 or less for the purpose of ensuring the workability.

[0034]

In addition, a modified polymer of the reactive silicon group-containing oxyalkylene polymer may be used as the component (A). Typical modified polymers include a polymer which is obtained, in the presence of a polyoxyalkylene polymer having the reactive silicon groups, by polymerizing a mixture composed of an alkyl (meth)acrylate monomer represented by the following general formula (8) and containing an alkyl group having 1 to 8 carbon atoms and/or acryl (meth)acrylate monomer represented by the following general formula (9) and containing an alkyl group having 10 or more carbon atoms and/or an alkyl (meth)acrylate monomer represented by the following general formula (10) and containing an reactive silicon group. In addition to this modified polymer, the blends in which the polymers of (8), (9) and (10) are blended with the reactive silicon group-containing oxyalkylene polymer may also be used:

$CH_2{=}C(R^5)COOR^6$ (8)

wherein R^5 represents a hydrogen atom or a methyl group, and R^6 represents an alkyl group having 1 to 8 carbon atoms;

$CH_2{=}C(R^5)COOR^7$ (9)

wherein R^5 is the same as above, and R^7 represents an alkyl group

having 10 or more carbon atoms; and

$CH_2=C(R^5)COOR^8-[Si(R^1_{2-b})(X^1_b)O]_mSi(R^2_{3-a})X^1_a$ (10)

wherein R^5 is the same as above, R^8 represents a divalent alkylene group having 1 to 6 carbon atoms, and R^1, R^2, X^1, a, b and m are the same as described above.

Examples of R^6 in the above general formula (8) may include alkyl groups having 1 to 8 carbon atoms, preferably 1 to 4 carbon atoms, and more preferably 1 or 2 carbon atoms, such as a methyl group, an ethyl group, a propyl group, a n-butyl group, a t-butyl group and a 2-ethylhexyl group. The monomers represented by the general formula (8) may be used each alone or in combinations of two or more thereof.

[0035]

Examples of R^7 in the above general formula (9) may include long-chain alkyl groups having 10 or more carbon atoms, usually 10 to 30 carbon atoms, and preferably 10 to 20 carbon atoms, such as a lauryl group, a tridecyl group, a cetyl group, a stearyl group and a biphenyl group. The monomers represented by the general formula (9) may be used each alone or in combinations of two or more thereof.

[0036]

Examples of R^8 in the above general formula (10) may include groups having 1 to 6 carbon atoms and preferably 1 to 4 carbon atoms, such as a methylene group, an ethylene group and a propylene group. Examples of the reactive silicon groups to be bonded to R^8 may include a trimethoxysilyl group, a methyldimethoxysilyl group, a triethoxysilyl group and a methyldiethoxysilyl group. The monomers represented by the general formula (10) may be used each alone or in combinations of two or more thereof.

[0037]

In the above polymerization, monomers other than those represented by formulas (8), (9) and (10) may be concomitantly used. Examples of such monomers may include: acrylic acids such as acrylic acid and methacrylic acid; amide group-containing monomers such as acrylamide, methacrylamide,

N-methylolacrylamide and N-methylolmethacrylamide; epoxy group-containing monomers such as glycidyl acrylate and glycidyl methacrylate; amino group-containing monomers such as diethylaminoethyl acrylate, diethylaminoethyl methacrylate and aminoethyl vinyl ether; and monomers such as acrylonitrile, styrene, methylstyrene, alkyl vinyl ether, vinyl chloride, vinyl acetate, vinyl propionate and ethylene. In this case, the ratio of the total amount of the polymerized monomers of formulas (8), (9) and (10) to the total amount of the polymerized monomers is preferably 50% or more, and particularly preferably 70 wt% or more.

[0038]

The filler (B) of the present invention is not limited to any specific fillers. Specific examples of the filler (B) may include: reinforcing fillers such as fumed silica, precipitated silica, silicic anhydride, hydrous silicic acid and carbon black; fillers such as calcium carbonate, magnesium carbonate, diatomite, calcined clay, clay, talc, titanium oxide, bentonite, organic bentonite, ferric oxide, zinc oxide, active zinc white, and organic fillers including hydrogenated castor oil, PVC and polyolefin; fibrous fillers such as asbestos, glass fiber and glass filament; inorganic balloons and organic balloons such as shirasu balloon, glass balloon, Saran balloon and phenolic balloon; one or more of these fillers may be used according to need. It is preferable that the used amount of the filler(s) is preferably 1 to 200 parts by weight, and particularly preferably 5 to 200 parts by weight in relation to 100 parts by weight of the component (A).

[0039]

No particular constraint is imposed on the curing catalyst (C) in the present invention, as long as it is the curing catalyst capable of accelerating the reaction of the reactive groups of the curable oxyalkylene polymer (A), which is capable of crosslinking by a reaction in the curable resin composition. Specific examples of the curing catalyst (C) may include:

titanium esters such as tetrabutyl titanate and tetrapropyl titanate; organotin compounds such as dibutyltin diacetylacetonate, dibutyltin dilaurate, dibutyltin maleate, dibutyltin diacetate, tin octylate and tin naphthenate; lead octylate; amine compounds such as butylamine, octylamine, dibutylamine, monoethanolamine, diethanolamine, triethanolamine, diethylenetriamine, triethylenetetramine, oleylamine, octylamine, cyclohexylamine, banzylamine, diethylaminopropylamine, xylylenediamine, triethylenediamine, guanidine, diphenylguanidine, 2,4,6-tris(dimethylaminomethyl)phenol, morpholine, N-methylmorpholine and 1,3-diazabicyclo(5,4,6)undecene-7 (DBU), and salts of these amines with carboxylic acids and the like; low molecular weight polyamide resins obtained from excessive polyamines and polybasic acids; reaction products between excessive polyamines and epoxy compounds; amino group-containing silane coupling agents such as silanol condensation catalysts well known in the art including aminopropyltrimethoxysilane and N-(aminoethyl)aminopropylmethyldimethoxysilane. One or more of these curing catalysts may be used according to need. The used amount of the curing catalyst(s) is preferably approximately 0.1 to 20 parts by weight, and more preferably 1 to 10 parts by weight in relation to 100 parts by weight of the component (A).

[0040]

The definition of the "plasticizer" in the present invention is intended not to include minor liquid ingredients used for dissolving powdery additives, etc.,

[0041]

To the curable composition of the present invention, adhesion-imparting agents, solvents or other additives may be added according to need.

[0042]

Examples of the adhesion-imparting agents may include:

amino group-containing silanes such as γ-aminopropyltrimethoxysilane, γ-aminopropylmethyldimethoxysilane, γ-(2-aminoethyl)aminopropyltrimethoxysilane, γ-(2-aminoethyl)aminopropylmethyldimethoxysilane, γ-(2-aminoethyl)aminopropyltriethoxysilane, γ-ureidopropyltriethoxysilane, N-β-(N-vinylbenzylaminoethyl)-γ-aminopropyltrimethoxysilane and γ-anilinopropyltrimethoxysilane; mercapto group-containing silanes such as γ-mercaptopropyltrimethoxysilane, γ-mercaptopropyltriethoxysilane, γ-mercaptopropylmethyldimethoxysilane and γ-mercaptopropylmethyldiethoxysilane; epoxy group-containing silanes such as γ-glycidoxypropyltrimethoxysilane, γ-glycidoxypropylmethyldimethoxysilane, γ-glycidoxypropyltriethoxysilane and β-(3,4-epoxycyclohexyl)ethyltrimethoxysilane; carboxysilanes such as β-carboxylethylphenylbis(2-methoxyethoxy)silane and N-β-(N-carboxylmethylaminoethyl)-γ-aminopropyltrimethoxysilane; and ketiminated silanes obtained by dehydration condensation between amino group-containing silanes and various ketones. These adhesion-imparting agents may be used each alone or in combinations of two or more thereof.

[0043]

Examples of the solvents may include nonreactive solvents such as hydrocarbons, acetates, alcohols, ethers and ketones. No particular constraint is imposed on the solvents as long as they are such solvents as described above.

[0044]

Examples of other additives may include: antisagging agents such as hydrogenated castor oil, organic bentonite and calcium stearate; colorants; antioxidants; ultraviolet absorbers; and photostabilizers. Additives such as adhesion

improvers, physical property adjusters, storage stability improvers, lubricants, pigments and foaming agents may also be added optionally according to need.

[0045]

No particular constraint is imposed on the method for producing the curable composition of the present invention which includes the component (A), and the component (C); there may be adopted common methods such as, for example, a method in which the components (A), (B) and (C) are combined and kneaded with a mixer, roll, kneader or the like, and a method in which the individual components are dissolved by use of a solvent and mixed together. The composition concerned may also be prepared as either a one-component composition or a two-component composition.

[0046]

[EXAMPLES]

(Example 1)

A curable composition was prepared by fully kneading a mixture composed of 120 parts by weight of polyoxypropylene polymer having 1.3 reactive silyl groups, on average, in a molecule thereof, and a number average molecular weight of 30,000, based on GPC, relative to polystyrene standard, 120 parts by weight of calcium carbonate as filler, 2 parts by weight of dibutyltin bisacetylacetonate as curing catalyst, 20 parts by weight of titanium oxide, 10 parts by weight of polyamide wax, 2 parts by weight of vinyltrimethoxysilane, and 3 parts by weight of N-(β-aminoethyl)-γ-aminopropyltrimethoxysilane. The following tests were carried out by use of the curable composition thus obtained:

(1) A 3 mm-thick sheet was prepared, which was cured by aging at 23°C at a humidity of 60% for 3 days, further subjected to the aging at 50°C in an oven for 4 days and then brought back to room temperature. Thereafter, a JIS No. 3 dumbbell was punched out from the sheet, and the modulus (M100) at the 100% elongation and the elongation at break thereof were measured at a tensile

rate of 200 mm/min with AUTOGRAPH;

(2) A joint in contact with a piece of natural marble was prepared, and the bleeding width of the liquid component from the sealant joint was measured; and

(3) A 3 mm-thick sheet was prepared, which was subjected to aging at 23°C at a humidity of 60% for 1 day. Thereafter, an acryl emulsion paint was applied onto the surface of the sheet, and the sheet was further subjected to aging at 23°C at a humidity of 60% for 1 day. Then, the sheet was exposed outdoors, and the dust adhesion onto the coated surface was subjected to a three grade evaluation.

The results thus obtained are shown in Table 1.

[0047]

(Example 2)

A curable composition was prepared in the same manner as in Example 1 except that 120 parts by weight of a polyoxypropylene polymer having 1.3 reactive silyl groups, on average, in a molecule thereof, and a number average molecular weight of 20,000, based on GPC, relative to polystyrene standard. The results thus obtained are shown in Table 1.

[0048]

(Comparative Example 1)

A curable composition was prepared in the same manner as in Example 1 except that 100 parts by weight of a polyoxypropylene polymer having 1.5 reactive silyl groups, on average, in a molecule thereof, and a number average molecular weight of 20,000, based on GPC, relative to polystyrene standard was used as the reactive silicon group-containing polyoxyalkylene polymer, and 55 parts by weight of a polyoxypropylene glycol having a number average molecular weight of 3,000 was used as a plasticizer. The evaluations of the obtained composition were carried out in the same manner as in Example 1. The results thus obtained are shown in Table 1.

[0049]

(Comparative Example 2)

A curable composition was prepared in the same manner as in Example 1 except that 120 parts by weight of a polyoxypropylene polymer having 1.3 reactive silyl groups, on average, in a molecule thereof, and a number average molecular weight of 12,000, based on GPC, relative to polystyrene standard. The results thus obtained are shown in Table 1.

[0050]

(Comparative Example 3)

A curable composition was prepared in the same manner as in Example 1 except that 120 parts by weight of a polyoxypropylene polymer having 1.6 reactive silyl groups, on average, in a molecule thereof, and a number average molecular weight of 20,000, based on GPC, relative to polystyrene standard. The results are shown in Table 1. The results thus obtained are shown in Table 1.

[0051]

[Table 1]

	Example		Comparative Example		
	1	2	1	2	3
M100 (MPa)	0.40	0.42	0.36	0.50	0.55
Elongation at break (%)	880	750	810	470	580
Breeding to natural marble after 2 months (mm)	< 1	< 1	5	< 1	< 1
Dust adhesion on the painted surface after 6 months	OΔ	OΔ	ΔX	OΔ	O
Overall evaluation	O	O	X	X	X

[0052]

From the results in Table 1, a curable composition comprising (A) an oxyalkylene polymer that has 0.6 to 1.5 reactive silicon groups per molecule, and has a number average molecular weight of 15,000 to 50,000, and a Mw/Mn value of 1.6 or less; (B) a filler; and (C) a curing catalyst, wherein the curable

composition comprising no plasticizer, provides a cured product which shows low staining, excellent mechanical properties.

[0053]

[Effect of the invention]

A cured product which shows low staining, excellent mechanical properties can be obtained from a curable composition comprising (A) an oxyalkylene polymer that has 0.6 to 1.5 reactive silicon groups per molecule, and has a number average molecular weight of 15,000 to 50,000, and a Mw/Mn value of 1.6 or less; (B) a filler; and (C) a curing catalyst, wherein the curable composition comprises no plasticizer.

[Document Name] Abstract

[Abstract]

[Subject] To provide a curable composition which improves the staining property, and ensures mechanical properties favorable for a sealant such as low stress and high elongation.

[Means for solving the problem] A curable composition comprising: (A) an oxyalkylene polymer that has 0.6 to 1.5 reactive silicon groups per molecule, and has a number average molecular weight of 15,000 to 50,000, and a Mw/Mn value of 1.6 or less; (B) a filler; and (C) a curing catalyst, wherein the curable composition comprises no plasticizer.

[Selective Figure] none